YUBA GOLDFIELDS
FISH BARRIER PROJECT

PRELIMINARY ENGINEERING REPORT

YUBA COUNTY, CALIFORNIA

CALIFORNIA DEPARTMENT OF WATER RESOURCES
CENTRAL DISTRICT
NOVEMBER 1999

YUBA GOLDFIELDS
FISH BARRIER PROJECT

PRELIMINARY ENGINEERING REPORT

YUBA COUNTY, CALIFORNIA

CALIFORNIA DEPARTMENT OF WATER RESOURCES
CENTRAL DISTRICT
NOVEMBER 1999

Contents

Organization

STATE OF CALIFORNIA
Gray Davis, Governor

THE RESOURCES AGENCY
Mary D. Nichols, Secretary for Resources

DEPARTMENT OF WATER RESOURCES
Thomas M. Hannigan, Director

Stephen Kashiwada Deputy Director	Steve Macaulay Chief Deputy Director	Raymond Hart Deputy Director

L. Lucinda Chipponeri
Assistant Director for Legislation

Susan N. Weber
Chief Counsel

Division of Local Assistance

William J. Bennett..... Division Chief

Central District

Karl P. Winkler .....District Chief
Emil Calzascia .....Chief, Water Management Branch

This report was prepared by:

Tim Talbert .....Associate Engineer, Water Resources

and:

Laurie Archambault ..... Environmental Specialist
Jean Witzman..... Environmental Specialist

with special assistance from:

Carl Messick ..... U.S. Fish and Wildlife Service
Craig Fleming ..... U.S. Fish and Wildlife Service
John Nelson ..... Department of Fish and Game
John Trembly ..... Western Aggregates, Inc.
Dave Sbaffi .....Cal Sierra Development, Inc.

Project Background

The Yuba Goldfields are located along the Yuba River near Daguerre Point Dam, approximately 10 miles northeast of Marysville. An area greater than 8,000 acres, the Goldfields have been the site of gold mining for nearly 100 years. The mining in this area has generated thousands of acres of an undulating cobble and rock terrain that has, in more recent years, been used to produce aggregate. Current operations in the Goldfields include gold mining by Cal Sierra Development, Incorporated and aggregate production by Western Aggregates, Incorporated.

As a result of the high permeability of the Goldfield's rocky soil, water from the Yuba River freely migrates into and through the Goldfields, forming interconnected ponds and canals throughout the undulating terrain. This high permeability causes water levels in the ponds and canals rise and fall according to the stage of the Yuba River. Generally, water from the Yuba River enters the Goldfield area from above Daguerre Point Dam, then migrates down-gradient through the Goldfields. A portion of this migrating water eventually returns to the Yuba River below Daguerre Point Dam via an outlet canal. This outlet canal helps to drain water out of the Goldfields to the Yuba River, which prevents high water levels from adversely impacting current mining and aggregate operations.

In recent years, fishery experts have discovered that adult anadromous fish species (spring-, fall-, and late fall-run Chinook salmon; American shad; and steelhead trout) migrate into the interconnected ponds and canals of the Goldfields via the area's outlet canal. Fish habitat within the ponds and canals is not conducive to anadromous fish survival; food supply is limited, predator habitat is extensive, and water quality conditions, especially temperature, are poor.

As a result of potential harm to fish species that enter the Goldfields, an investigation was undertaken to examine the feasibility of constructing a fish barrier within the Goldfield's outlet canal. This report contains the details of the investigation and includes preliminary engineering and an environmental evaluation for the development of a structure that would prevent adult anadromous fish from entering the Goldfields.

The U.S. Fish and Wildlife Service provided funding for this investigation through the Anadromous Fish Restoration Program (AFRP). The AFRP was established by the Central Valley Project Improvement Act to make all reasonable efforts to ensure that, by the year 2002, the natural production of anadromous fish in Central Valley rivers and streams will be sustainable on a long-term basis at levels not less than twice the average levels attained during the period of 1967-1991.

Hydrology

The Yuba Goldfields are located along the Yuba River near Daguerre Point Dam in Yuba County, as shown in Figure 1. The Yuba River drains the western slope of the Northern Sierra Nevada in Sierra, Placer, Yuba and Nevada counties. A component of the Sacramento River system, the Yuba River is a tributary of the Feather River, which is a tributary of the Sacramento River.

Groundwater hydrology within the Goldfields is greatly influenced by Daguerre Point Dam and the Yuba River. Daguerre Point Dam, constructed in the early 1900s to control migration of hydraulic mining debris, creates a river stage differential; river stage above Daguerre Point Dam is more than 20 feet greater than river stage below the dam. As a result of this differential and with the Goldfield's highly permeability soil, Yuba River water enters the Goldfield area from above Daguerra Point Dam, then migrates down-gradient through the Goldfields, forming interconnected ponds and canals throughout the area. Water within many of these pools and canals is directed back to the Yuba River via an outlet canal that is located approximately one mile downstream of Daguerre Point Dam.

Seasonal variations in Yuba River flow also affect groundwater hydrology of the Goldfields. River flows during winter and spring months are generally greater than flows during summer and fall months. As river flows change so do river stages. The Goldfield's highly permeable soil allows water elevations within the Goldfields to rise and fall quickly according to Yuba River stage.

As a result of the Goldfield's hydrology, water elevations within the outlet canal always exceed water elevations in the Yuba River at the confluence of the outlet canal. Consequently, water within the outlet canal always flows to the river, never the opposite. Currently, during river flows less than 20,000 cubic feet per second (cfs), water elevations within the outlet canal exceed river elevations by approximately six feet. As river flows increase above 20,000 cfs, so does the difference in water elevations.

The Goldfield's outlet canal is used throughout the year to direct Goldfield water into the Yuba River, preventing high water levels from adversely impacting current mining and aggregate operations. Canal flows during summer and fall months are estimated to range from five to 50 cfs; canal flows during winter and spring months can exceed 1,000 cfs. The canal is especially important for the prevention of flooding in certain areas of the Goldfields during high flow periods. During these periods, the canal is used to direct large quantities of water back to the Yuba River.

The Yuba-Brophy diversion also influences flow in the outlet canal. This diversion, located at Daguerre Point Dam, is used by the Yuba County Water Agency to distribute water from the Yuba River to nearby farms for irrigation. During high diversion periods, water levels within the diversion canal elevate, inducing additional seepage into the goldfields.

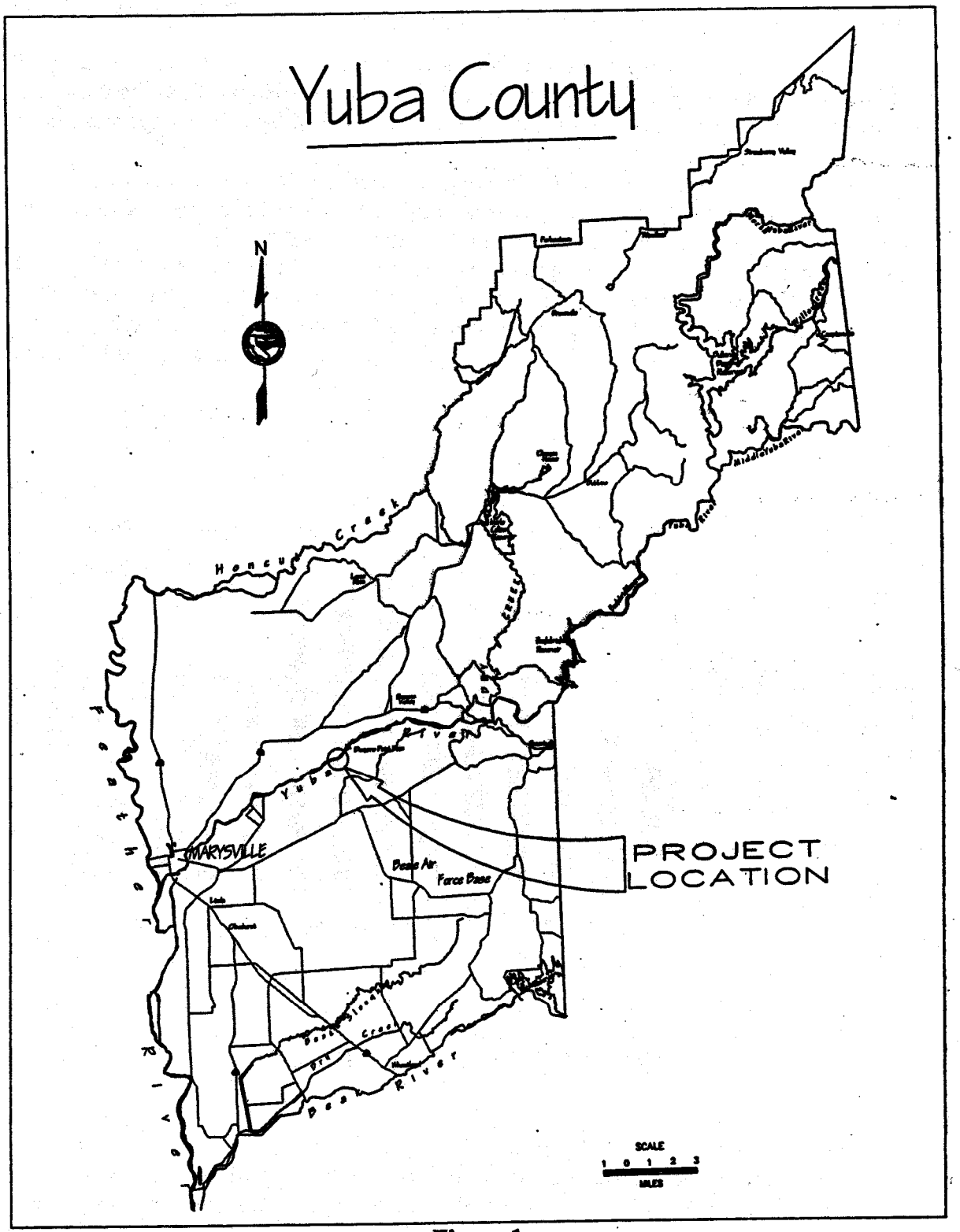


Figure 1
PROJECT LOCATION

Yuba River Flows

Flow data were collected and analyzed to identify historic Yuba River flow patterns near the Goldfields and Daguerre Point Dam. The data were used to determine monthly and yearly average flows, river flow verses stage relationships, and flow event probabilities.

Monthly average flows varied somewhat from daily flows: daily flows during some months greatly exceeded or lagged monthly averages. However, with upstream dams acting to regulate and stabilize river flows, high or low daily flows were generally short-lived. Data from the Yuba River's Smartville gauging station indicate that flows average 2600 cfs annually, with the highest flows occurring in February and March. Figure 2 shows monthly and yearly average Yuba River flows. Flow data used in Figure 2 are presented in Appendix A.

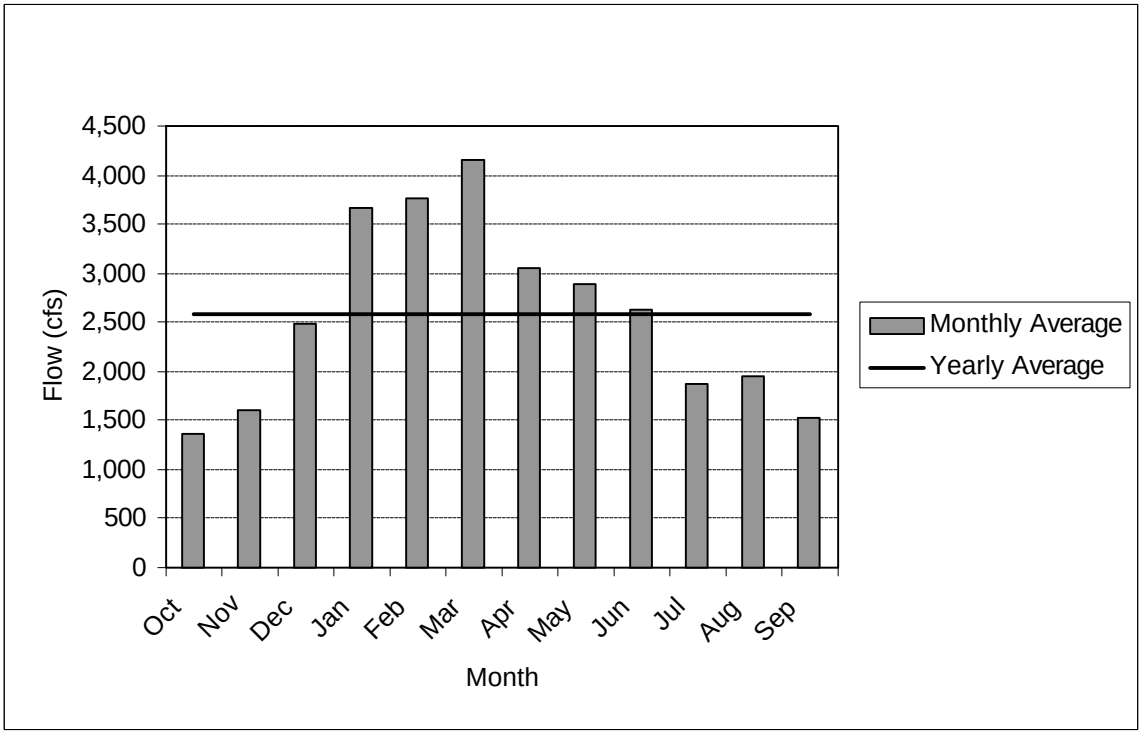


Figure 2
HISTORICAL YUBA RIVER FLOWS

Data obtained from the U.S. Army Corps of Engineers (COE) and stage measurements recorded near the Goldfield's outlet canal have been used to develop a rating curve (river flow verses river stage), as shown Figure 3. In 1986 the COE developed a 100-year flood simulation model for the Yuba River to evaluate the effects of such an event. This model produced flow and stage relationships at various points along the Yuba River. One such point was located below Daguerre Point Dam near the Goldfield outlet canal. The flows

modeled by COE ranged from 5,000 cfs to a 100-year event of 135,000 cfs. Field measurements were extrapolated to establish flow and stage values below 5,000 cfs.

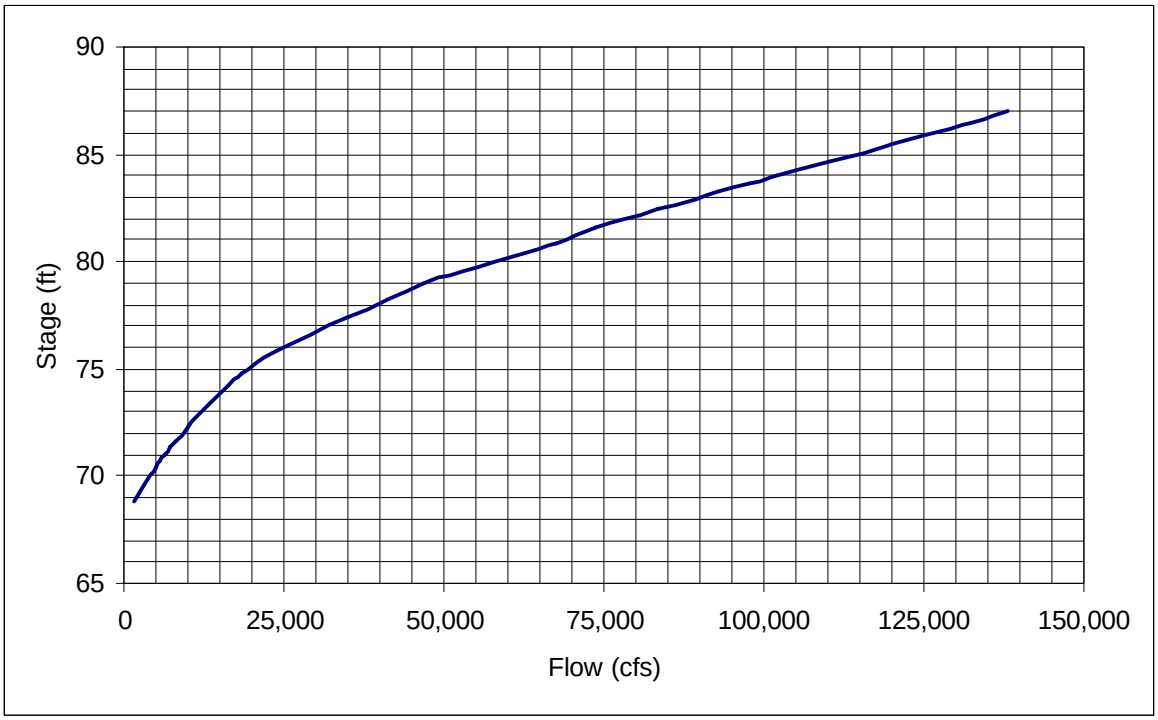


Figure 3
YUBA RIVER BELOW DAGUERRE POINT DAM
RATING CURVE

The data obtained from the COE and Smartville gauging station have also been used to estimate flow event probabilities. Flow event probabilities were determined by establishing a log-normal distribution of historic flows. This distribution was defined with the 100-year flow from the COE flood model and the yearly average flow from the Smartville gauging station. With a historic flow distribution established, event probabilities and corresponding flows were estimated, as shown in Table 1.

Table 1
YUBA RIVER FLOW EVENTS

Event	Flow
1 in 10 years	23,000 cfs
1 in 25 years	51,000 cfs
1 in 50 years	85,000 cfs
1 in 75 years	114,000 cfs
1 in 100 years	135,000 cfs

Design Objectives

Several design objectives have been established to ensure that a satisfactory fish barrier design is achieved. Design objectives for a fish barrier located within the Goldfield's outlet canal include the following:

- Prevent adult anadromous fish from entering Goldfields.
- Not increase water elevations within the Goldfields.
- Require minimal maintenance.
- Allow for passage or removal of debris.

The primary objective of this project is to prevent adult anadromous fish from entering the Goldfields through the Goldfield outlet canal, which serves as a drain, allowing water within the Goldfields to flow to the Yuba River. The Goldfield outlet canal is especially important during periods of high flows. During these periods, the outlet canal must be able to pass high flows in order to prevent flooding in nearby low-lying areas. It is also important that flows not be greatly restricted during non-flood conditions. If flows during these periods are restricted, water elevations within the Goldfields rise, adversely affecting Goldfield mining operations. Consequently, this project must be designed to accommodate high flows exiting the Goldfields. In addition, this project must be low-maintenance and allow for the passage or removal debris.

Design Alternatives

Several fish barrier design alternatives were evaluated as part of this investigation: a gabion structure, a screen structure, an inflatable dam structure, a velocity barrier, and a "do nothing" alternative.

The primary function of a Goldfield fish barrier is to prevent adult fish from entering the canals and ponds of the Goldfields. Representatives of Western Aggregates, Inc. and Cal Sierra Development, Inc. have confirmed that the Goldfield outlet canal is the only surface water connection to the Yuba River and that no other site will be used to direct Goldfield surface water to the Yuba River. As a result, the most appropriate site to construct such a barrier is within the outlet canal near the confluence of the canal and the Yuba River. All alternatives were evaluated based on construction at this location.

Gabion Alternative

One alternative is to construct a gabion structure across the Goldfield outlet canal. (A gabion consists of a woven metal basket filled with rocks and cobbles). Gabions would be stacked in alternating patterns to an elevation equal to the 75-year flood elevation, forming a fish barrier across the outlet canal.

A gabion fish barrier structure offers many benefits: high permeability, low operation and maintenance requirements, and low construction costs. The gabions would be constructed using highly permeable rock and cobble, which would allow water to pass through the structure and into the Yuba River. During flood events, canal flows would pass over a dropped section of the structure.

A gabion structure would be simple to operate and require little maintenance. Maintenance for this structure would include periodic inspections and debris removal. It is important to note, however, that the accumulation of debris near the structure would not necessarily affect the operation of the structure. In addition, gabion structures are highly resistant to erosion and able to withstand ground settlement, which further reduces potential maintenance requirements.

Construction costs for this alternative would be relatively low. Rock and cobble material is readily available at the construction site, and construction equipment requirements are minimal.

Screen Alternative

Another alternative is to construct a structure consisting of several screen panels that would be installed across the outlet canal, creating a fish barrier while also allowing Goldfield water to pass to the Yuba River. The screen panels could be raised and lowered to allow debris or flood flows to pass. A frame structure would be constructed with corrosion-resistant metal and supported with piles to provide support for and access to the screen panels. A gabion abutment would connect each side the frame structure to the canal banks.

This alternative offers some advantages and disadvantages. Advantages include the ability to pass Goldfield flows while preventing fish from entering the Goldfields. Also, this alternative would allow flood flows to pass due to the ability to lower the screen panels, thus creating an unrestricted flow path.

Disadvantages for the screen alternative include high maintenance requirements and susceptibility to damage. Maintenance requirements for this alternative would be high given the number of mechanical components and the existence of debris within the outlet canal. Each panel would have a hinge to allow for rotation, a winch for raising and lowering, and a locking device to secure the panel when in the raised position. All of these components would require regular inspections and maintenance, including cleaning and lubrication.

Inflatable Dam Alternative

The inflatable dam alternative consists of an inflatable bladder secured to a concrete foundation constructed across the outlet canal. Under normal flow conditions, the bladder is inflated, creating a barrier for fish entering the Goldfields. Under flood flow conditions, the bladder is deflated, allowing high flows to exit the Goldfields. This alternative requires an air compressor to inflate the bladder, pressure sensors to detect bladder pressure and water elevation, and electronic controlling equipment for operation.

The inflatable dam alternative offers some advantages and disadvantages. Advantages of this alternative include the ability to prevent fish from entering the Goldfields by inflating the dam's bladder. Under flood flow conditions, the bladder can be deflated, allowing high flows to exit the Goldfields. Bladder inflation and deflation can be activated automatically through the electronic controlling equipment.

Disadvantages for this alternative include high maintenance, high construction costs, and reduced Goldfield outlet flows when compared to other alternatives. The inflatable dam alternative requires several mechanical and electronic mechanisms, all of which would require periodic inspection and maintenance by specialized technicians. This alternative requires the construction of a concrete foundation, which would require the dewatering of the highly porous canal material. Dewatering would be a very expensive and difficult undertaking. With the bladder inflated during non-flood conditions, this alternative would restrict outlet flows beyond that of other alternatives. Water could not seep through the structure as with other alternatives.

Velocity Barrier

A fish velocity barrier can be created when water velocity exceeds the maximum swimming velocity of a fish species. This type of barrier can be created, for example, by directing canal flow through a pipe or culvert. The water velocity that would be required for this project is 30 feet per second, given the fish species of interest. To generate a velocity of this magnitude would require a very large head differential, greater than 400

feet for a 48-inch diameter pipe. This amount of head is clearly not available at this site, therefore this alternative is not possible for this project.

"Do nothing" Alternative

One alternative is the "do nothing" alternative: leave the existing temporary barrier in place and make no modifications. Currently, a rock embankment prevents fish from entering the Goldfields. The embankment is composed of native material, measuring approximately 15 feet in height and spanning the outlet canal.

The embankment was constructed as a temporary fix after high flood flows in January 1997 destroyed a previously constructed, screened culvert fish barrier. The high flows exceeded the culvert's capacity and eroded material supporting the structure.

Leaving the current temporary embankment in place presents two problems. The embankment was not intended to be a permanent fish barrier. The native material composing the embankment is highly susceptible to erosion and would not withstand high flows exiting the Goldfields. As a result, the embankment would have to be rebuilt after each period of high flows. In addition, the embankment, under non-flood conditions, restricts exiting flows migrating through the embankment, causing high water elevations with the Goldfields.

Preferred Alternative

Upon consideration and review of all alternatives, it was determined that the gabion fish barrier alternative best addresses all design objectives. This determination was based on a consensus of project stakeholders, including Western Aggregates, Inc., Cal Sierra Development, Inc., U.S. Fish and Wildlife Service, and California Department of Fish and Game.

Design Description

Preliminary engineering drawings for a gabion fish barrier structure are presented in Sheets 1 through 3. The structure will be constructed with corrosion-resistant gabion baskets filled with rock of a specified gradation. Gabions will be stacked in alternating patterns and tied together with corrosion-resistant wire. The structure will have an exposed top width of approximately 165 feet with a dropped section in its center portion to allow high flow passage. The dropped section will have an elevation equal to the 75-year river flow elevation. In addition, the top of the structure will be designed to accommodate maintenance equipment. On the upstream face of the structure, additional gabions will be placed with rock of a small gradation to act as a removable filter. On the downstream face, a rock buttress will be placed to provide stability and erosion protection for the structure. Gabions will also be placed on the upstream and downstream side-slopes for added erosion protection.

Operation & Maintenance requirements for this structure will include periodic inspections and periodic replacement of the filter gabions. Inspections should identify problems such as areas of erosion, low seepage amounts, or gabion basket failure. Filter gabions must be removed periodically, cleaned or filled with clean rock and then replaced.

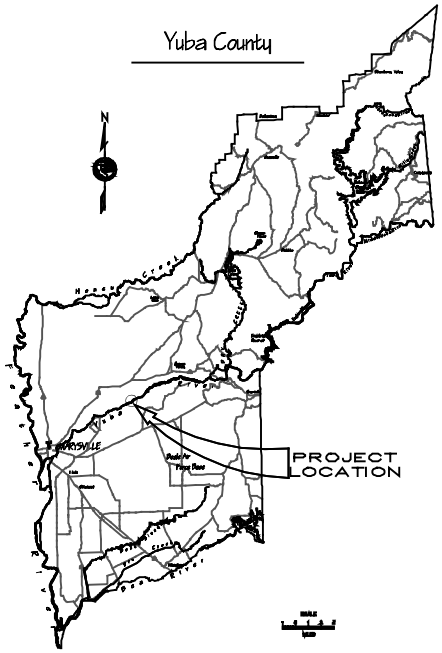
PRELIMINARY ENGINEERING

For

YUBA GOLDFIELDS

FISH BARRIER PROJECT

Yuba County, California



LOCATION MAP

INDEX OF SHEETS

SUBMITTED BY:

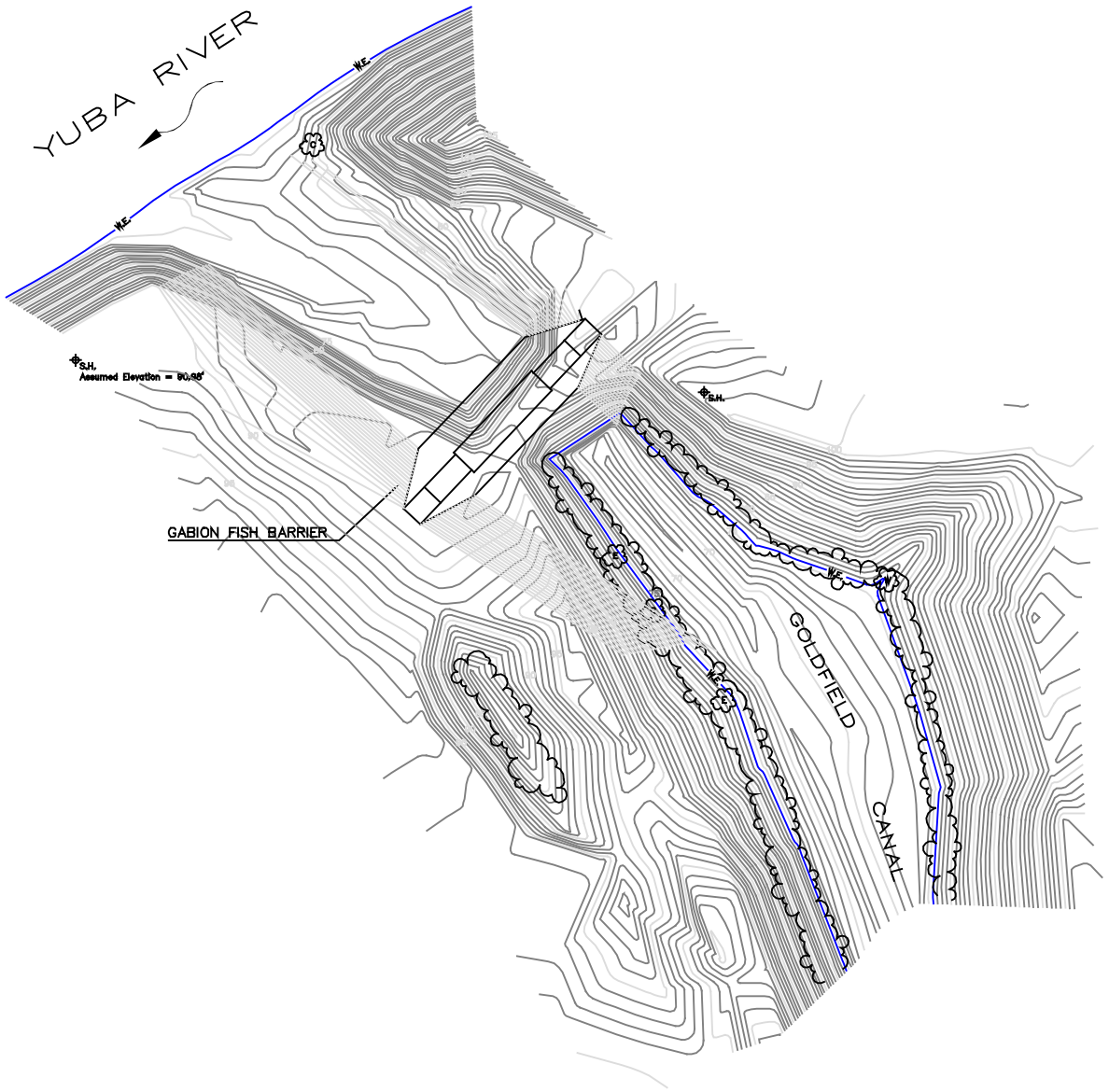
California Department of Water Resources

APPROVED BY:

California Department of Fish and Game

DRAFT

YUBA GOLDFIELDS FISH BARRIER PROJECT	**TITLE PAGE & LOCATION MAP**	State of California The Resources Agency Department of Water Resources CENTRAL DISTRICT	SCALE: N/A DRAWN BY: TJT	REVISION DATE: October 27, 1999 SHEET: 1 of 3



PLAN VIEW

LEGEND

S.H. SURVEY HUB

W.E. WATER'S EDGE

EDGE OF VEGETATION

TREES/SHRUBS:

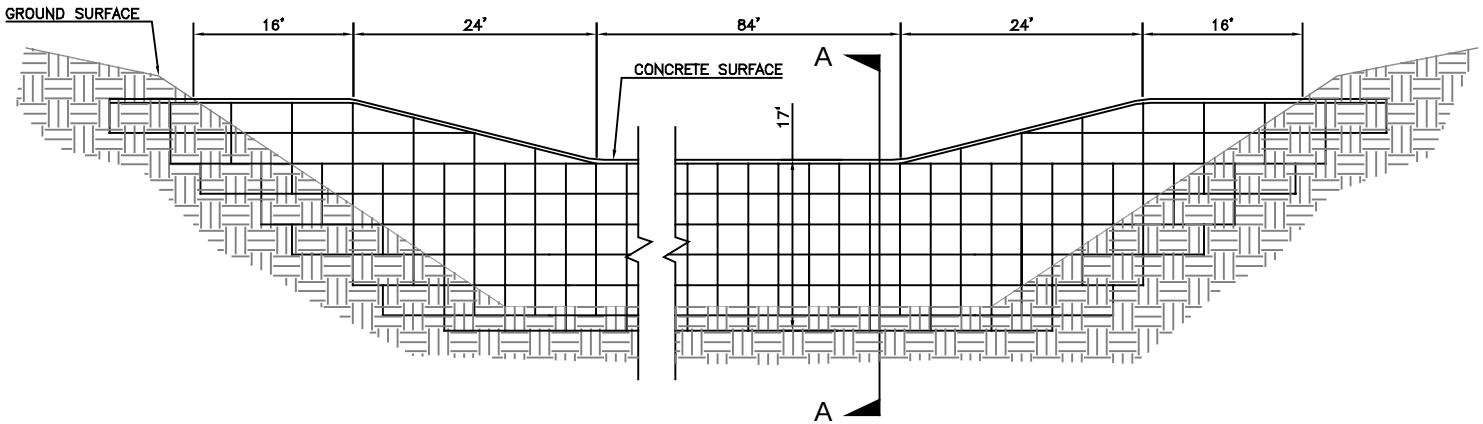
E Elderberry
W Willow
C Cottonwood

NOTES:

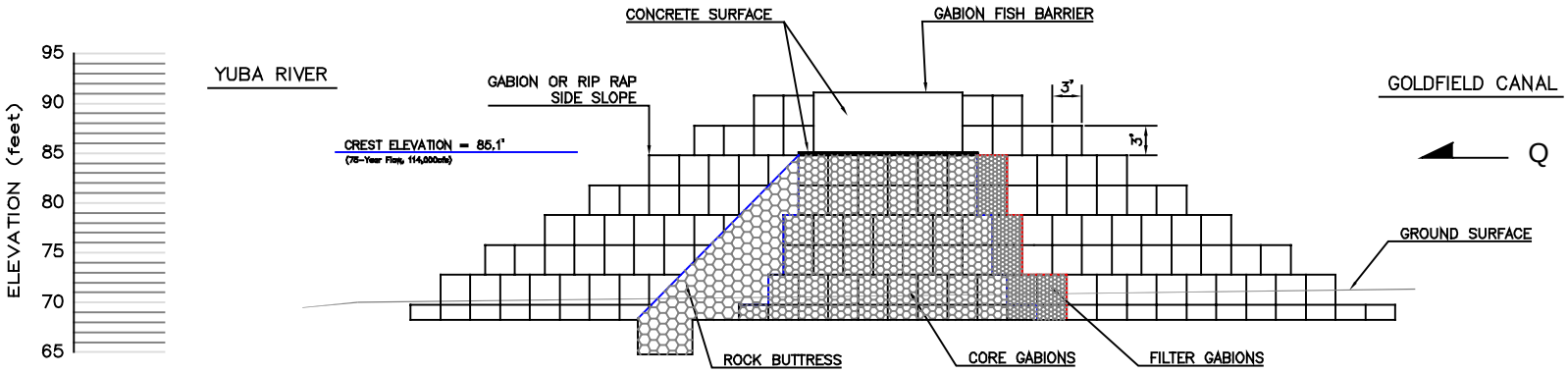
1. CONTOUR ELEVATIONS ARE BASED ON ASSUMED DATUM.
2. CONTOUR AND RIVER ELEVATIONS WERE MEASURED ON JULY 13, 1999.

DRAFT

YUBA GOLDFIELDS FISH BARRIER PROJECT	SITE PLAN	State of California The Resources Agency Department of Water Resources CENTRAL DISTRICT	SCALE: 0 25 50 feet DRAWN BY: TJT	DATE: October 27, 1999 SHEET: 2 of 3



SOUTH ELEVATION



DRAFT

SECTION A-A

NOTES:

1. ELEVATIONS ARE BASED ON ASSUMED DATUM.
2. ROCK GRADATIONS FOR FILTER GABIONS, CORE GABIONS AND ROCK BUTTRESS SHALL BE DETERMINED DURING FINAL DESIGN. ROCK GRADATION FOR FILTER GABIONS SHALL PROVIDE ADEQUATE FILTRATION AND, AS MUCH AS PRACTICAL, PREVENT FINES AND DEBRIS FROM BECOMING LODGED WITHIN THE GABION STRUCTURE. GRADATIONS FOR CORE GABIONS AND ROCK BUTTRESS SHALL BE AS LARGE AS PRACTICAL TO ALLOW MAXIMUM PERMEABILITY WHILE PROVIDING ADEQUATE STRUCTURAL STABILITY.

YUBA GOLDFIELDS FISH BARRIER PROJECT	GABION FISH BARRIER	State of California The Resources Agency Department of Water Resources CENTRAL DISTRICT	SCALE: 0 5 10 Feet DRAWN BY: TJT	DATE: October 27, 1999 SHEET: 3 of 3

Final Design

The drawings presented in Sheets 1 through 3 are to be considered preliminary designs. During the final design process, the size or configuration of the structure may change to accommodate design requirements. The final design engineer should perform a thorough review of this project prior to developing final designs.

Codes and Standards

Final designs shall conform to the following:

- Final structural designs shall comply with the 1997, or latest, Uniform Building Code requirements.
- All current applicable CalOSHA safety standards must be met.

Final Design Instructions

The development of final designs will include, but is not limited to, the following items:

- Determining appropriate site grading/excavation.
- Specifying gabion basket size and basket material. Weight restrictions for filter gabions may limit filter gabion size. Basket material for all gabions shall be corrosion-resistant.
- Detailing gabion basket connections. Core gabions shall be connected with corrosion-resistant wire. Filter gabions shall not be connected to allow for periodic removal and replacement.
- Determining appropriate rock gradations for filter gabions, core gabions, and rock buttress. Rock gradation for filter gabions shall provide adequate filtration and, as much as practical, prevent fines and debris from becoming lodged within the gabion structure. Gradations for core gabions and rock buttress shall be as large as practical to allow maximum permeability while providing adequate structural stability.
- Performing stability analysis for gabion structure.
    - Structure shall be designed to withstand flows with water elevations greater than the height of the structure.
    - The structure shall be designed to withstand the weight of maintenance equipment passing across the top of the structure.
- Detailing concrete surface.

Project Cost Estimate

The estimated costs to construct a gabion fish barrier structure within the Goldfield's outlet canal are shown in Table 2. The estimate includes costs for final design, construction permitting, and project construction. A contingency factor of 20 percent and a final design cost of $15,000 were used in determining the total project cost estimate. Cost shown for gabion construction is based on the assumption that native rock will be used for gabion construction.

Table 2
PROJECT COST ESTIMATE

ITEM DESCRIPTION	QUANTITY	UNIT COST	ITEM COST
Mobilization / Demobilization	1 LS	$5,000	$5,000
Site Preparation / Excavation	1 LS	$25,000	$25,000
Gabion Construction	2500 CY	$55	$137,500
Rock Buttress	625 CY	$35	$21,875
Concrete Surfacing	1 LS	$10,000	$10,000
		Subtotal	$199,375
		Contingencies (20%)	$39,875
		Construction Subtotal	$239,250
		Final Design	$15,000
		Environmental Documentation & Permitting	$30,000
		Total Project Estimate	**$284,000**

Environmental Setting

Climate

The Sacramento Valley has a Mediterranean-type climate, with hot, dry summers and mild winters with relatively light precipitation. Valley temperatures normally range from winter lows near freezing to summer highs of about 110°F. In the project area, precipitation is heaviest from November through March, when 80 percent of the annual rainfall occurs. Normal annual precipitation is approximately 21 inches.

Topography

The elevation in the project area ranges from approximately 100 feet to about 150 feet. The Yuba River channel at the project site consists of small to medium-sized cobbles and vegetation in areas above the normal flow elevation. The riverbank at the project site consists of steeply piled cobbles. Beyond the riverbank, the terrain is composed of large mounds of tailings and associated inter-mound depressions. Some of the inter-mound depressions support native vegetation.

Soils

The substrate at the project site consists of mine tailings dredged from the Yuba River during historic and current gold mining operations. Cobbles are piled in long narrow tailing mounds between 5 and 40 feet in height (California Soil Survey, unpublished 1988).

Surface Water

The Yuba River has a watershed of about 1,300 square miles. North Yuba River flows are impounded in New Bullards Bar Reservoir, about 30 miles northeast of Marysville. The reservoir has a storage capacity of 966,000 acre-feet. Releases from New Bullards Bar Reservoir join the Middle Yuba River and flow into Englebright Reservoir. South Yuba River also flows into Englebright Reservoir. Releases from Englebright Dam flow westerly 12.7 miles to Daguerre Point Dam, and then 11.4 miles to join the Feather River at Marysville. Daguerre Point Dam serves both to impair downstream movement of mining debris and as the point of diversion for the major water and irrigation districts using Yuba River flows. The facilities are operated for fisheries maintenance, water supply and recreation.

Vegetation

The vegetation in the project area consists of riparian scrub and forest. A large area adjacent to, and immediately south of, the project site has been disturbed by gold mining operations. This area consists of piles of cobbles with little vegetation. Strips of riparian vegetation, consisting of willow (*Salix* sp.), cottonwood (*Populus fremontii*), sycamore (*Platanus racemosa*), Himalayan blackberry (*Rubus discolor*), and elderberry (*Sambucus mexicana*), have developed around ponds and in some inter-mound locations. There is also a small freshwater emergent wetland, dominated by tules (*Scirpus* sp.), in the near vicinity of the project. Several elderberry shrubs occur at the project site.

Potential Impacts

Impacts to the elderberries should be avoided, if at all possible, through the project's design and should be flagged during installation of the barrier to prevent accidental disturbance. If impacts to any elderberries will be incurred as a result of the project, the U.S. Fish and Wildlife Service should be consulted. Impacts to elderberries must be mitigated. Some impacts will occur to the riparian scrub vegetation surrounding the project site during installation of the barrier. Mitigation for riparian habitat losses may be necessary, as well.

Sensitive Plant Species

Species lists from the USFWS (Appendix D) and a search of the Browns Valley quadrangle in the CNDDB (California Natural Diversity Data Base) Rarefind Database include three sensitive plant species potentially occurring in the project area. Table 3 lists each sensitive species, its status, its habitat, and whether it is expected to occur in the project area.

Table 3
POTENTIAL SENSITIVE PLANT SPECIES AT THE PROJECT SITE

Species	**Status[1] Fed.**	**State**	**CNPS**	**Habitat**	**Comments**
Fritillaria eastwoodiae Butte fritillary	SC	--	1B	chaparral, woodlands, and openings in lower montane conifer forest, flowers Mar-May	No habitat is present at the project site
Cypripedium fasciculatum Clustered lady's-slipper	SC	--	4	lower montane conifer forest and North Coast conifer forest in serpentinite seeps and streambanks, flowers Mar-Jul	No habitat is present at the project site
Pseudobahia bahiifolia Hartweg's golden sunburst	FE	CE	1B	grassland, open woodland in clay soil, 150 m, flowers Mar-Apr	No habitat is present at the project site

[1] Status
Fed. = Federal Listing
SC - Previous to Feb. 1996 Federal Register these species were considered candidate species. Currently the USFWS has dropped all candidate species from active review, but they occur on this list as species of special concern.
PE - Proposed for federal listing as endangered.
PT - Proposed for federal listing as threatened.
FT - Federally listed as threatened.
FE - Federally listed as endangered.

State = State Listing
SSC - DFG Species of Special Concern.
CR - State listed as rare.
CT - State listed as threatened.
CE - State listed as endangered.

CNPS = California Native Plant Society
1B - Plants, rare, threatened, or endangered in California or elsewhere.
2 - Plants, rare, threatened, or endangered in California, but more common elsewhere.

Wildlife

The project area supports habitat for wildlife species associated with riparian habitats. Animals which inhabit the river bottom and riparian areas include the spotted skunk (*Spilogale gracilis*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), and long-tailed weasel (*Mustela frenata*). Aquatic furbearers which may be found in this area include beaver (*Castor canadensis*), river otter (*Lutra canadensis*), and muskrat (*Ondatra zibethica*).

Over 100 species of birds are known from habitats typical of this area at various times of the year (Wooster and Wickwire, 1970). Upland game birds include California valley quail (*Lophortyx californicus*), mourning dove (*Zenaidura macroura*), and Chinese ringnecked pheasant (*Phasianus colchicus*). Mallard (*Anas platyrhynchas*) and wood duck (*Aix sponso*) are found along water courses.

Sensitive Wildlife Species

Fifty-one sensitive wildlife species were identified as potentially occurring in the project area on the USFWS species list (Appendix D) and/or in the CNDDB. Table 4 lists each sensitive species, its status, its habitat, and whether it is expected in the project area. The species of this list whose habitat type occurs at the project site appear in **bold type** in the table and are discussed below.

Table 4
POTENTIAL SENSITIVE WILDLIFE SPECIES AT THE PROJECT SITE

Species	Fed. Status	State Status	Habitat	Comments
AMPHIBIANS:				
Rana aurora draytonii **California red-legged frog**	**FT**	**--**	**Inhabits quiet pools of streams, marshes, and occasional ponds. Breeds March to July in northern California.**	**Requires burrows. There may not be burrows in close enough proximity to the proposed project site. Should be surveyed for.**
Rana boylii Foothill yellow-legged frog	SC	--	Western flank of the Sierra south to Kern County up to 6000 ft. Inhabits streams or rivers of woodland and forest. Usually found near riffles where there are rocks and sunny banks. Breeding and egg laying anytime from mid-March to May.	No available habitat in project area. Project site is probably out of the range for this species.

Scaphiopus hammondii Western spadefoot toad	SC	--	Spends majority of its life in underground burrows within grasslands and occasionally, valley-foothill hardwood woodlands.	Uses grasslands with shallow, temporary pools for breeding and egg laying. No available habitat in project area.
BIRDS:				
Accipiter gentilis Northern goshawk	SC	SSC	Low elevation riparian habitats in foothills with dense mature conifer and deciduous forest.	No available habitat in project area.
Ammodramus savannarum Grasshopper sparrow	SC	--	Occurs in dense, dry or well-drained grasslands. Builds nests of grasses and forbs in slight depressions on the ground. Needs thick cover of grasses and forbs.	
Agelaius tricolor **Tricolored blackbird**	**SC**	**SSC**	**Breeds near fresh water, in emergent wetland with tall, dense cattails or tules, but also in thickets of willow, blackberry, wild rose and tall herbs. Colonies contain a minimum of 50 individuals.**	**Should be surveyed for at the appropriate time. However, impacts could be avoided if work is done in September to October.**
Athene cunicularia hypugea Western burrowing owl	SC	SSC	Can be found almost throughout the State in level and treeless areas, open grasslands and scrublands. Uses rodent or other burrows for roosting.	No burrows (or burrowing opportunities) exist in project area.
Asio flammeus Short-eared owl	SC	SSC	Requires dense vegetation of tall grasses or brush, ditches, and wetlands for resting and roosting.	No available habitat in project area.
Botaurus lentiginosus American bittern	SC	--	Requires tall, dense fresh or saline emergent wetlands.	Vegetation in the project area is not dense or large enough for this species.
Branta canadensis leucoparcia Aleutian Canada goose	FT	--	Typically roosts on open water of lakes or ponds. Prefers to nest near water and suitable feeding areas. Feeds on grains and forbs, as well as aquatic plants. Primarily winters in California.	No available habitat in project area.
Buteo regalis Ferrugenous hawk	SC	SSC	Uncommon winter resident and migrant in this region. Prefers grassland and agricultural areas and low foothills surrounding valleys.	No available habitat in project area.
Chaetura vauxi Vaux's swift	SC	SSC	Roosts in hollow trees and snags. Nests in redwood, Douglas-fir, and occasionally other conifers.	No available habitat in project area.

Charadrius montanus Mountain plover	PT	SSC	Found on short grasslands and plowed fields can be found below 3200 ft.	No available habitat in project area.
Chlidonias niger Black tern	SC	SSC	Uses fresh emergent wetlands, lakes, ponds, moist grasslands and agricultural fields. Often nests in dense wetland vegetation.	No available habitat in project area.
Chondestes grammacus Lark sparrow	SC	--	Requires scattered trees or shrubs for lookout and song perches and for cover. Nest built on ground in shaded herbaceous vegetation; occasionally in a shrub or tree.	No nesting habitat available at the project site.
Contopus cooperi Olive-sided flycatcher	SC	--	Requires large, tall trees (usually conifers) for nesting and for roosting.	No available habitat in project area.
Cypseloides niger Black swift	SC	SSC	Builds nest in moist location on sea cliff, or on cliff behind or adjacent to, waterfalls in deep canyons.	No nesting habitat available at the project site. Site is probably out of range for the species.
Dendroica occidentalis Hermit warbler	SC	--	Requires mature stands of pine and fir for cover in breeding season. Woodlands of live oak and deciduous trees are utilized during migration.	No available habitat in project area.
Haliaeetus leucocephalus **Bald eagle**	**FT**	**CE**	**Nests in large, old-growth, or dominant live tree with open branchwork, especially ponderosa pine. Species has been known to occur in unexpected places.**	**Should be surveyed for at project site.**
Lanius ludovicianus **Loggerhead shrike**	**SC**	**SSC**	**Prefers open habitats of lowlands and foothills with scattered shrubs, trees, posts, fences, utility lines, or other perches.**	**Species could occur at project site and should be surveyed for.**
Melanerpes lewis Lewis' woodpecker	SC	--	Winters in open oak savannah and open deciduous and coniferous habitats. Requires snags with cavities. Nests in sycamore, cottonwood, oak, or conifer.	No available habitat in project area.
Plegadis chihi White-faced ibis	SC	SSC	Found in dense marsh vegetation near foraging areas in shallow water or muddy fields.	A rare visitor in Central California. No available habitat in project area.
Selasphorus rufus Rufous hummingbird	SC	--	Occurs in habitats that provide trees and shrubs including lowland riparian, open woodlands, scrub, chaparral, and mountain meadows.	No available habitat in project area.
			Nests and roosts in tree cavities in	Project site is

Sphyrapicus ruber Red-breasted sapsucker	SC	--	deciduous hardwoods and coniferous forests.	probably out of nesting range for the species.
Spizella breweri Brewer's sparrow	SC	--	Breeds in treeless shrub habitats, usually with some herbaceous understory. Occurs as a fall transient west of the Sierra Nevada.	Project site is out of nesting range for the species.
Strix occidentalis occidentalis California spotted owl	SC	SSC	These may occur in dense stands of riparian/hardwood forests, especially in foothills bordering eastern portions of the Central Valley.	No available habitat in project area.
Thryomanes bewickii **Bewick's wren**	**SC**	--	**Occurs in mixed and montane chaparral habitats, pinyon-juniper habitats, borders of woodlands and coniferous forest with brushy understory, and riparian habitats.**	**Species could occur at project site and should be surveyed for.**
INVERTEBRATES:				
Branchinecta lynchi Vernal pool fairy	FT	--	Found in vernal pools.	No available habitat in project area.
Cicindela hirticollis abrupta Sacramento Valley tiger beetle	SC	--		No information available from USFWS.
Desmocerus californicus dimorphus **Valley elderberry longhorn beetle**	**FT**	--	**Full life-cycle requires the blue elderberry (*Sambucus mexicana*).**	**Elderberries occur at the project site.**
Goeracea oregona Sagehen Creek goracean caddisfly	SC	--		No information available from USFWS.
Lepidurus packardi Vernal pool tadpole shrimp	FE	--	Found in vernal pools.	No available habitat in project area.
Linderiella occidentalis California linderiella	SC	SSC	Found in vernal pools.	No available habitat in project area.
REPTILES:				
Clemmys marmorata **Western pond turtle**	**SC**	--	**Found on partially submerged logs, rocks, floating vegetation, and open mud banks. Eggs are laid from March to August in sandy banks.**	**Species could occur at project site but is unlikely to be impacted by project unless water levels change substantially. No nests would be affected.**
Phrynosoma coronatum			**Found in exposed gravelly and**	**Could occur at**

frontale **California horned lizard**	**SC**	**--**	**sandy substrates, with scattered shrubs, as well as clearings in riparian woodlands from Yuba County through the San Joaquin Valley and Coastal Ranges to the Transverse Range**	**project site and should be considered.**
Thamnophis gigas **Giant garter snake**	**FT**	**CT**	**Found in valley floor wetlands. Avoids larger waterways with predatory fish and woodland streams with excessive cover.**	**Could occur at the project site and should be considered.**
MAMMALS:				
Corynorhinus townsendii pallescens Pale Townsend's big-eared bat	SC	SSC	Townsend's Big-eared bat can be found throughout California, including the Sierra foothills on a year-round basis. Caves and mines are used as roosting habitat. Birth occurs from May to July.	No available roosting habitat in project area.
Corynorhinus townsendii townsendii Pacific western big-eared bat	SC	--	Can be found in caves, mine tunnels, rock outcrops, structures, etc. Avoid disturbance of roosts in May and June during late pregnancy and while young are non-volant.	No available roosting habitat will be affected.
Dipodomys californicus eximius Marysville Heerman's kangaroo rat	SC	SSC	Heerman's kangaroo rat requires well drained soil and is common in annual grassland, coastal scrub, mixed and montane chaparral, and early suuessional stages of valley foothill hardwood and hardwood/conifer habitats. Breeds from February into October, with peak in April.	No habitat for burrowing exists at the project site.
Euderma maculatum Spotted bat	SC	SSC	Closely associated with rocky cliffs, but may be found on rock outcrops, structures, etc. Avoid disturbance of roosts in May and June during late pregnancy and while young are non-volant.	No available roosting habitat will be affected.
Eumops perotis californicus Greater western mastiff-bat	SC	SSC	Found in crevices in building walls, cliff faces, rock outcrops, boulder jumbles, structures, etc. Avoid disturbance of roosts in June and July during late pregnancy and while young are non-volant.	No available roosting habitat will be affected.
Lepus americanus tahoensis Sierra Nevada snowshoe hare	SC	--	The snowshoe hare is an uncommon resident at upper	No available habitat in project area.

			elevations in the Cascade Mtns. In Siskiyou and Del Norte counties south through the Sierra Nevada to Mariposa, Mono, and Madera counties. Primary habitat is montane riparian with thickets of alders and willows, and stands of young conifers interspersed with chaparral. Breeds mid-February to June or July.	
Martes pennanti pacifica Pacific fisher	SC	--	The Fisher is an uncommon permanent resident of the Sierra Nevada, Cascades, and Klamath Mtns., plus in a few areas in the North Coast Ranges. Occurs in intermediate to large-tree stages of coniferous forests and deciduous-riparian habitats with a high percent canopy closure. Young are born February through May.	No available habitat in project area.
Myotis ciliolabrum Small-footed myotis bat	SC	--	Found in middle to high elevations, desert scrub, grasslands, oak and pinyon woodlands. Roosts in mines and trees.	No available roosting habitat will be affected.
Myotis evotis Long-eared myotis bat	SC	--	A widespread, but uncommon resident which prefers mixed coniferous/hardwood forests. It aviods the arid Central Valley. The young are born from May to July, with a peak in June. It roosts in buildings, crevices, spaces under bark, and snags.	Preferred habitat is lacking at the project site.
Myotis thysanodes Fringed myotis bat	SC	--	A rare resident found in pinyon-juniper, valley foothill hardwood and hardwood-conifer, generally at 4000-7000 ft. They roost in caves, mines, buildings, and crevices.	The project site is at a lower elevation than the preferred for this bat. No available roosting habitat will be affected.
Myotis volans Long-legged myotis bat	SC	--	Found in pinyon-juniper, Joshua tree woodland, montane coniferous forest habitats of California and is most common in woodland and forest habitats above 4000 ft. It roosts in rock crevices, buildings, under tree bark, in snags, mines, and caves. Young are born in June and July.	No available roosting habitat will be affected.
Myotis yumanensis	SC	--	Found in a wide variety of habitats.	No available roosting

Yuma myotis bat			Associated with low elevation reservoirs. Roosts in buildings, trees, mines, caves, bridges and rock crevices.	habitat will be affected.
Perognathus inornatus San Joaquin pocket mouse	SC	SSC	Requires fine-textured soils in dry, open grasslands or scrub areas between 1100 and 2000 ft in the Central and Salinas valleys.	Project area is probably out of species range.

[1] Status
Fed. = Federal Listing
SC - Previous to Feb. 1996 Federal Register these species were considered candidate species. Currently the USFWS has dropped all candidate species from active review, but they occur on this list as species of special concern.
PE - Proposed for federal listing as endangered.
PT - Proposed for federal listing as threatened.
FT - Federally listed as threatened.
FE - Federally listed as endangered.

State = State Listing
SSC - DFG Species of Special Concern.
CR - State listed as rare.
CT - State listed as threatened.
CE - State listed as endangered.

Species Accounts and Potential Impacts

The following section contains a description of each species which has been found or which has appropriate habitat in the project area, as well as a discussion of the potential impacts that may occur as a result of the project. Impacts to all bird species can be avoided if project activity occurs during the months of September through October, thereby avoiding nesting times.

California red-legged frog

The California red-legged frog is a Federal Threatened species that inhabits quiet pools in streams, marshes, and ponds west of the Sierra-Cascade crest and along the Coast Ranges the entire length of the state. It typically occurs below 1200m in elevation (Stebbins 1951). It is uncommon in the Sierra Cascase portion of its range and uncommon to common elsewhere.

The species is aquatic and prefers shorelines that are densely vegetated. The California red-legged frog breeds from January to July with a peak in February. Eggs are deposited in permanent pools attached to emergent vegetation (Stebbins 1954).

Activities that result in habitat destruction have a negative effect on the California red-legged frog. If the species is present at the project site, potential impacts could result from removal of emergent vegetation during the egg-laying season (January to July).

Tricolored blackbird

The tricolored blackbird is a California State Species of Special Concern and a Federal Species of Concern that occurs throughout the Central Valley and in coastal areas from Sonoma County south. It breeds near fresh water where there is emergent vegetation of

tall, dense cattails or tules, but also occurs in thickets of willow, blackberry, wild rose, and tall herbaceous vegetation. The breeding season is from mid-April to late July.

Potential impacts from this project could occur during the nesting season of mid-April to late July if the species is present at the site.

Bald eagle

The bald eagle is a Federal Threatened and California State Endangered species that requires large bodies of water with abundant fish and adjacent snags or other perches. It usually nests near a permanent water source and typically requires large old-growth trees or snags in remote, mixed stands. However, the bald eagle has been reported in some atypical locations. The species breeds from February through July with peak activity in March through June. Territories have been abandoned after human activities or disturbances have occurred near nests.

Potential impacts could occur if the species is on site and project activity begins during the nesting season of February through July.

Loggerhead Shrike

The loggerhead shrike is a Federal Species of Concern and a State Special Species of Concern that occurs in the lowlands and foothills of California. It typically prefers open habitats with scattered shrubs, trees, or other perches. Nest-building occurs on stable branches in densely-foliaged shrubs or trees. Eggs are laid from March into May and the young become independent in July or August.

If the project design results in the removal of some of the mature riparian trees on site, this species could be impacted if it occurs there and is disturbed during the nesting season.

Bewick's wren

The Bewick's wren is a Federal Species of Concern that most often occurs in chaparral habitats but is also known to occur in riparian habitats and the borders of woodlands and coniferous forests. It nests in cavities in the ground, in snags, rock crevices, or virtually any naturally occurring or artificially made cavity, but prefers natural cavities and rock crevices. Breeding occurs from mid-February into early August with peak activity from mid-May to late June.

Impacts to occur to individuals of the species could occur as a result of project construction if they are nesting on site.

Valley elderberry longhorn beetle

The valley elderberry longhorn beetle is a Federal Threatened species. Two critical habitat zones have been established (USFWS 1991c): 1) the Sacramento Zone: An area in the City of Sacramento and, 2) the American River Parkway Zone. In addition, two "essential habitat" zones have been described: 1) the American River Parkway Zone: An

area within the American River Parkway; and 2) the Putah Creek Zone in Solano County (USFWS 1984).

Due to extensive work since its listing (particularly during the past 10 years), the reported range has been extended considerably. These new data, based upon both the presence of adults and the presence of characteristic emergence holes in elderberry (*Sambucus* spp.), are well-summarized by Barr (USFWS 1991b) and define the range as extending throughout the Central Valley, from Redding (Shasta County) to Bakersfield (Kern County) (USFWS 1991b). The eastern limit is defined by several observations from the western slope of the Sierra Nevada at elevations up to approximately 3,000 feet (USFWS 1991b). The western limit, much more difficult to define due to limited data (particularly from the southwest quadrant of the Central Valley), is defined as Cold Canyon, near Lake Berryessa (Napa County). Elevations range from approximately 30 feet on the Central Valley floor to approximately 3,000 feet in the Sierra Nevada, and to approximately 700 feet in the Coast Range. Cumulatively, these data support a range definition of the Central Valley, from Redding to Bakersfield, extending up to 3,000 feet on the western slope of the Sierra Nevada, and to 700 feet on the eastern slope of the Coast Range. Historically, its range is assumed to have included riparian zones surrounding all of the major Central Valley river drainages. These riparian corridors (and associated savannas), once much more extensive, probably offered ample habitat for the valley elderberry longhorn beetle.

All stages of the valley elderberry longhorn beetle life cycle are closely associated with elderberry. Adults lay eggs upon the plants; these eggs hatch and the larvae bore in and excavate pupal cells. After pupation, new adults emerge and use elderberry for resting, foraging, and mating. Data suggest a that general preference for mature, established elderberry stands; with larval utilization of healthy, somewhat younger stems (most in branches with stem diameters between 2 and 4 inches) (USFWS 1991b). Continued destruction of riparian habitat is considered the single greatest threat to the species.

Potential impacts to the species can occur through removal of the elderberry shrubs that occur on the project site. Impacts to elderberry shrubs require consultation with USFWS and mitigation.

Western pond turtle

The western pond turtle, a federal Species of Concern, can be found in suitable aquatic habitat throughout California, west of the Sierra-Cascade crest. It is associated with permanent ponds, lakes, streams, irrigation ditches or permanent pools along intermittent streams. Pond turtles require basking sites such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks. Most activity is diurnal. Individuals are active all year where climates are warm, but hibernate underwater in bottom mud during cold periods elsewhere. Eggs are laid in nests constructed in sandy banks from March to August, with the incubation period between 73 to 80 days (Zeiner et al., 1988).

The pond turtle, if it exists at the project site, is unlikely to be affected by the project unless water levels change significantly. Project activity will not disturb any sandy

substrate because the site is composed of cobbly tailings from mining operations, so no nests are expected to be impacted.

California horned lizard

The California horned lizard, a federal Species of Concern, can be found in exposed gravelly and sandy substrates, with scattered shrubs, as well as clearings in riparian woodlands as far north as Yuba County, through the San Joaquin Valley and Coastal Ranges, and as far south as the Transverse Ranges. They have been observed to be active between April and October, with hatchlings first appearing in July and August. In the Central Valley, the conversion of a large percentage of the historical habitat from relic lake sand dunes and alluvial fans to agriculture and other developments, have led to isolated populations in California.

The cobbly substrate in most of the project area is not appropriate habitat for this species. Potential habitat in the area along the intake channel was destroyed by previous disturbance, therefore, impacts due to this project are unlikely for this species.

Giant garter snake

The giant garter snake is listed as both Federal and California State Threatened. No critical habitat has been designated for this species.

The giant garter snake once ranged throughout the wetlands of California's Central Valley from Buena Vista Lake near Bakersfield in Kern County, north to the vicinity of Chico in Butte County (Hansen and Brode 1980). Giant garter snakes appear to have been extirpated from the San Joaquin Valley south of Mendota, Fresno County (Hansen and Brode 1980, Stebbins 1985, Rossman and Stewart 1987). The present known distribution extends from near Chico south to the vicinity of Burrel, Fresno County (DFG 1992a).

Habitats occupied by giant garter snakes contain permanent or seasonal water, mud bottoms, and vegetated dirt banks (Fitch 1940, Hansen and Brode 1980). Recent field studies have shown that giant garter snakes are associated with aquatic environments that contain the following resources: 1) sufficient water during the active (summer) season to supply food and cover; 2) grassy banks for basking; 3) emergent vegetation for cover during the active season; and 4) high ground or uplands that provide cover and refuge from flood waters during the dormant (winter) season (Hansen 1988, Hansen and Brode 1993). Predatory fish that were introduced throughout the Central Valley's system of artificial waterways have reduced the suitability of nearly all permanent waters for this species by preying upon, and competing with, giant garter snakes. The widely introduced bullfrog (*Rana catesbeiana*) also preys upon this species (Treanor 1983).

Potential impacts could occur if the species are present at the project site during removal of riparian vegetation for construction of the barrier.

Fish

The Yuba River provides spawning and rearing habitat for anadromous fish, including American shad (*Alosa sapidissima*), striped bass (*Morone saxatilis*), fall-run and spring-run chinook salmon (*Oncorhynchus tshawytscha*), and steelhead trout (*Oncorhynchus mykiss*). Other fish species found in the Yuba River include smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), white catfish (*Ameiurus catus*), channel catfish (*Ictalurus punctatus*), bullhead (*Ameiurus* sp.), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), Sacramento pikeminnow (*Ptychocheilus grandis*), common carp (*Cyprinus carpio*), and Sacramento sucker (*Catostomus occidentalis*).

Sensitive fish species

USFWS and/or the CNDDB list eight sensitive fish species as potentially occurring in the project area including spring-run chinook salmon and steelhead trout. Table 5 lists each sensitive species, its status, its habitat, and whether it is expected in the project area. The species which have been found or which have appropriate habitat in the project area (in **bold type** in the table) are described below, as well as potential impacts to them.

Table 5
POTENTIAL SENSITIVE FISH SPECIES AT THE PROJECT SITE

Species	Fed. Status	State Status	Habitat	Comments
Acipenser medirostris **Green sturgeon**	**SC**	**SSC**	**Found in Sacramento River from the Delta and Bays all the way to Red Bluff Diversion Dam. Most common in the Trinity and Klamath rivers, occasional in lower Feather and Yuba Rivers.**	**Could be below Daguerre Dam so may be in the project area. Reported in the Yuba River in 1991 by the Dept. of Fish and Game.**
Hypomesus transpacificus Delta smelt	FT	CT	Found primarily in the lower Sacramento and San Joaquin rivers, in the delta above their confluence, and in Suisun Bay. They have been found as far north as the confluence on the American and Sacramento rivers.	The project area is out of species range.
Onchorynchus mykiss **Central Valley steelhead**	**FT**	--	**Can be found in cold headwaters, creeks, and small to large rivers of California's Central Valley.**	**Critical habitat has been proposed for steelhead that includes lower and upper Yuba River.**
Onchorynchus tshawytscha Winter-run Chinook salmon	FE	CE	Can be found in the Sacramento River and in Battle Creek but not in other tributaries.	The project area is out of the species range.
Onchorynchus tshawytscha **Spring-run Chinook salmon**	**FT (as of 11/15/99)**	**CT**	**Rivers of California's Central Valley. Adults return to the Yuba River in March-July. Inhabit cold, deep pools in summer.**	**Spawns Sept.-November (DFG 1991)**
Central Valley spring-run chinook salmon - critical habitat	**FT**	**CT**	**Has not yet been designated by the National Marine Fisheries Service (NMFS) at this time.**	
Onchorynchus tshawytscha **Fall/late fall-run Chinook salmon**	**Candidate**	--	**From Daguerre Pt. Dam downstream to north side of Marysville is important spawning habitat (USFWS 1995).**	
Central Valley fall/late fall-run chinook - critical	**N/A**		**Has not been designated by NMFS at this time.**	

fall-run chinook - critical habitat		--	**NMFS at this time.**	
Pogonichthys macrolepidotus Sacramento splittail	FT	SSC	Found in waters of Suisun Bay, Suisun marsh, and the Sacramento and San Joaquin rivers and Delta. Juveniles have been captured in the Feather River (DWR 1999a, 1999b). Not reported in the Yuba River.	Splittail have been found in the Sacramento River at Red Bluff Diversion Dam and in the Feather River.
Spirinchus thaleichthys Longfin smelt	SC	SSC		Ranges as far north as Rio Vista or Medford Island in the Delta. Project area is out of species range.

[1] Status
Fed. = Federal Listing
SC - Previous to Feb. 1996 Federal Register these species were considered candidate species. Currently the USFWS has dropped all candidate species from active review, but they occur on this list as species of special concern.
PE - Proposed for federal listing as endangered.
PT - Proposed for federal listing as threatened.
FT - Federally listed as threatened.
FE - Federally listed as endangered.
State = State Listing
SSC - DFG Species of Special Concern.
CR - State listed as rare.
CT - State listed as threatened.
CE - State listed as endangered.

Species Accounts

Three races of Chinook salmon are found in the Yuba River: spring-run, fall-run, and late fall-run.

Spring-run Chinook Salmon

Spring-run salmon are listed as State Threatened and Federal Threatened (as of November 15, 1999). The original spring-run population had disappeared from the Yuba River by 1959 (Fry, 1961). The remnant spring-run found today is the result of strays from the Feather River or the infrequent stocking of hatchery reared fish by DFG (Meyer, 1989). Spring-run Chinook salmon migrate into the Yuba River as early as March and as late as August. Generally, the majority of the run enters the river in May and June. The adults spend the summer in deep pools in the Narrows reach of the river, where water temperatures seldom exceed 60^0F. Spawning can begin in August but the peak is between September and early November. Fry emergence begins in November and extends through January. Emigration can occur within a few weeks of emergence or the juveniles can rear in the area until June.

Fall/Late Fall-run Chinook Salmon

Fall-run and late fall-run are candidates for listing under the Federal Endangered Species Act. They have no status under the California Endangered Species Act. Adult fall and late fall-run return to the Yuba River September through January, with peak migration occurring from October through November (USFWS 1995; DFG 1991). Spawning begins in October and continues through January (USFWS 1995). Most spawning occurs just north of Smartville downstream to Daguerre Point Dam and from Daguerre Point Dam downstream to the north side of Marysville (DFG 1991). Fry and juvenile rearing occurs from December through April and juvenile emigration peaks from April through June (USFWS 1995).

Green Sturgeon

Green sturgeons have been reported in the Yuba River but it is unlikely that they spawn there. Beak (1976 as cited in DFG 1991) reported green and white sturgeon as occuring in the Yuba River. Unfortunately, information on life stage was not provided. USFWS (1995) did not find evidence of green sturgeon spawning in the Yuba River in the following years: 1967, 1968, 1974, 1979, 1984, 1985, 1987, and 1990. Additionally, DFG (1991) did not find green sturgeon in electrofishing and snorkel surveys conducted in May 1987 and 1988. No impacts to the species are expected to occur since they are not known to spawn in the Yuba River.

Steelhead Trout

Steelhead trout, the anadromous form of rainbow trout, are listed as Federally Threatened. They migrate downstream to the ocean as juveniles and return to freshwater to spawn when they are between 2 and 4 years old. This spawning migration occurs from October through April (USFWS 1995) in the Yuba River. Unlike salmon, not all steelhead die after spawning, and survivors return to the ocean between April and June. Some fish may even survive long enough to make several spawning migrations. Fry and juvenile rearing occur year round. In the lower Yuba River, juvenile emigration occurs in March through June (California Department of Fish and Game, 1991).

Though estimates of population abundance are lacking for the first half of this century, it is known that steelhead runs formerly reached the upper Sacramento River and all tributaries with sufficient flow and habitat (including the American, Feather, and Yuba Rivers). It is estimated that as much as 95% of historical spawning and rearing habitat has been blocked by construction of dams and water diversions as well as habitat degradation (USFWS, 1995).

Data on the steelhead run in the Yuba River are limited, but there are indications that numbers increased after the construction of New Bullards Bar Dam and Reservoir. The Yuba has also been planted with hatchery raised steelhead (USFWS, 1995).

Potential Impacts

Potential impacts due to construction and operation of the fish barrier will be avoided or mitigated in the following ways:

1) Turbidity in water column during removal of the existing gravel barrier and installation of gabions and support for the steel fish screen will be a temporary impact. The substrate is mostly cobbles, so a minimal amount of sediment will be disturbed. Project construction should occur when anadromous species are not spawning so that no impacts to them would occur (spawning occurs in January through April for steelhead, in September through November (DFG 1991) for spring-run, and in October through January for fall/late fall-run (USFWS 1995). To minimize impacts to fall-run and steelhead emigration, project construction should occur in July and August.

References

Beak Consultants, Inc. 1976. Benefits and impacts of the Marysville Lake Project on fish and wildlife. A report prepared for the US Army Corps of Engineers, Sacramento District, 275 pp + appendices, *as cited in* DFG 1991.

California Department of Fish and Game. 1991. *Final Report: Lower Yuba River Fisheries Management Plan*. Department of Fish and Game Stream Evaluation Report #91-1, Sacramento, 197pp.

Department of Water Resources. 1996. Draft Browns Valley Irrigation District Fish Screening Project, Preliminary Engineering and Environmental Assessment. Central District.

_____. 1999a. Feather River study, Chinook salmon emigration survey, March – June 1996. Environmental Services Office, Sacramento. *In press.*

_____. 1999b. Feather River study, Chinook salmon emigration survey, December 1997 – June 1998. Environmental Services Office, Sacramento. *In press.*

Fitch, H.S. 1940. A biogeographical study of the *ordinoides* artenkreis of garter snakes (genus *Thamnophis*). Univ. Calif. Publ. Zool. 44:1-150.

Fry, D. H. 1961. King salmon spawning stocks of the California Central Valley, 1940 - 1959. California Fish and Game, 47 (1): 55-71. In California Department of Fish and Game, 1991, *Final Report: Lower Yuba River Fisheries Management Plan*. Department of Fish and Game Stream Evaluation Report #91-1.

Hansen, G.E. 1988. Review of the status of the giant garter snake (*Thamnophis couchi gigas*) and its supporting habitat during 1986-1987. Final report for California Department of Fish and Game, Contract C-2060. 31 pp.

Hansen, G.E. and J.M. Brode. 1980. Status of the giant garter snake *Thamnophis couchii gigas* (Fitch). Inland Fisheries Endangered Species Program Special Publication 80(5):1-14. California Department of Fish and Game, Sacramento, CA.

Meyer, F. 1989. Personal communication. In California Department of Fish and Game, 1991, *Final Report: Lower Yuba River Fisheries Management Plan*. Department of Fish and Game Stream Evaluation Report #91-1.

Moyle, P.B., J.E. Williams, and E.D. Wikramanayake. 1989. *Fish species of special concern of California*. Department of Wildlife and Fisheries Biology, University of California, Davis, 222pp.

Orians, G.H. 1960. *Autumnal breeding in the tricolored blackbird*. Auk 77:379-398.

Rossman, D.A. and G.R. Stewart. 1987. Taxonomic reevaluation of *Thamnophis couchii* (Serpentes: Colubridae). Occ. Papers Mus. Zool. Louisiana State University, Baton Rouge. 63:1-25.

Schaffter. 1980. In U.S. Fish and Wildlife Service, *Working paper: habitat restoration actions to double natural production of anadromous fish in the Central Valley of California.* Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.

Skinner, M.W. and B.M. Pavlik. 1994. Inventory of rare and endangered vascular plants of California. California Native Plant Society.

Stebbins, R.C. 1951. *Amphibians of western North America*. Univ. of California Press, Berkeley. 538pp.

Stebbins, R.C. 1954. *Amphibians and reptiles of western North American.* McGraw-Hill, New York. 536pp.

Stebbins, R.C. 1966. *A field guide to western reptiles and amphibians*. The National Audobon Society and National Wildlife Federation, Houghton Mifflin Company Boston, 279pp.

Stebbins, R.C. 1985. A field guide to western reptiles and amphibians. 2nd edition. Houghton Mifflin Company, Boston, MA.

Steinhart, P. 1990. *California's Wild Heritage: Threatened and endangered animals in the Golden State.* Department of Fish and Game, Sacramento, 108pp.

Treanor, R.R. 1983. Contributions to the biology of the bullfrog, *Rana catesbeiana* Shaw, in California. Administrative Report No. 83-1. Department of Fish and Game, Inland Fisheries Branch, Rancho Cordova, CA.

U.S. Fish and Wildlife Service. 1992. Federal Register Proposed Rules, 57(90):19856-19862.

_____. 1984. Valley elderberry longhorn beetle recovery plan. Portland, OR. 62 pp.

_____. 1991b. The distribution, habitat, and status of the Valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (Insecta: *Coleoptera: Cerambycidae*). U.S. Fish and Wildlife Service, Sacramento, CA. 134 pp.

_____. 1991c. "Critical habitat - fish and wildlife." Code of Federal Regulations. Title 50, Part 17, Subpart "I," Section 17.95. 1991 ed. 235-236.

_____. 1995. Working Paper on restoration needs: habitat restoration actions to double natural production of anadromous fish in the Central Valley of California. Vol 3. May 9, 1995. Prepared for the USFWS under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.

_____. 1995. *Working paper: habitat restoration actions to double natural production of anadromous fish in the Central Valley of California.* Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.

U.S. Geological Survey. Unpublished 1988. *California Soil Survey: Yuba County*.

Wooster, T.W., and R.H. Wickwire. 1970. *A report on the Fish and Wildlife Resources of the Yuba River to be affected by the Marysville Dam and Reservoir and Marysville Afterbay and measures proposed to maintain the resources.* Department of Fish and Game, Environmental Services Administrative Report 7-4, 100pp.

Zeiner, D.C., W.F. Laudenslayer, Jr., and K.E. Mayer. 1988. *California's Wildlife Volume 1 Amphibians and reptiles*. The Resources Agency Department of Fish and Game, Sacramento, California, 272pp.

Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White. 1990. *California's Wildlife Volume III Mammals.* The Resources Agency Department of Fish and Game, Sacramento, California, 407pp.

Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White. 1990. *California's Wildlife Volume II Birds.* The Resources Agency Department of Fish and Game, Sacramento, California, pp. 731